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10/567,627	07/05/2006	Josef Aspelmayr	S3-03P04867	1314

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EXAMINER	
MCCALISTER, WILLIAM M	
ART UNIT	**PAPER NUMBER**
3753	

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12/16/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/567,627	ASPELMAYR ET AL.	
	Examiner	Art Unit	
	WILLIAM MCCALISTER	3753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _06 November 2009_.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _10-28_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _10-28_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

1. In view of the appeal brief filed on 11/6/209, PROSECUTION IS HEREBY REOPENED. New grounds of rejection are set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) initiate a new appeal by filing a notice of appeal under 37 CFR 41.31 followed by an appeal brief under 37 CFR 41.37. The previously paid notice of appeal fee and appeal brief fee can be applied to the new appeal. If, however, the appeal fees set forth in 37 CFR 41.20 have been increased since they were previously paid, then appellant must pay the difference between the increased fees and the amount previously paid.

A Supervisory Patent Examiner (SPE) has approved of reopening prosecution by signing below:

/Kevin P. Shaver/

Supervisory Patent Examiner, Art Unit 3754.

Claims 1-9 have been cancelled. Claims 10-28 are pending for consideration.

Claim Rejections - 35 USC § 103

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 10-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Klenk (US 2002/0011762) in view of Schrod (DE 19 944 733, with US Patent 6,563,252 used as an English language equivalent thereof) and Wirbeleit I (US 5,479,902).

Regarding claims 10 and 11, Klenk discloses (see FIG 2) charging and/or discharging (from 0V to 100V) an actuator (8) in accordance with a control action (applied voltage, determined by “engine controller 9” and “switch over control unit 7”) to move the actuator to a predetermined first open valve position (“injection setting a"; see Abstract - voltages supplied to actuator correspond to various open valve positions) specified by a first setpoint value (100V) and charging and/or discharging (from 100V to 200V) the actuator in accordance with the control action to move the actuator from the first open valve position (“injection setting a”) to a predetermined second open valve position (“injection setting b”) specified by a second setpoint value (200V) such that the actuator is not substantially completely discharged while moving from the first open valve position to the second open valve position (see FIG 2), the first open valve corresponding to a charge state (100V), and the second open valve position corresponding to a further charge state (200V).

Klenk discloses idle times of the actuator (the ideal profiles of settings “a”, “b” and “c", which are represented by dotted lines in FIG 2), but does not disclose the step of determining a controlled variable (i.e., voltage at the actuator) reflecting the charge state of the actuator during these idle times, and regulating the control action (i.e., applied voltage) during these idle times. Schrod teaches that it was known in the art at the time of invention to determine a controlled variable ("actuator voltage, U_p”) during idle times, and to regulate a control action (the applied voltage) during idle times, in order to avoid actuator discharge due to parasitic resistances (see col. 5 lines 50-57). To avoid discharge of Klenk’s actuator during idle times due to parasitic resistances, it would have been obvious to determine a controlled variable (voltage at the actuator) and to regulate the control action in response thereto, as taught by Schrod.

Klenk does not disclose the step of acquiring an external measured variable in the form of pressure at the valve and regulating the control action in dependence on the pressure during the idle time. Wirbeleit I teaches that it was known in the art at the time of invention to:

> acquire a measured variable in the form of pressure at an injection valve (see col. 3 lines 12-16; to obtain a “particular quantity of fuel to be injected” the pressure must be known, since according to Bernoulli’s Principle the pressure determines the rate of flow through orifice 18a; it is further submitted that US 5,601,067 provides evidence that Wirbeleit I (same inventor) contemplated a

pressure sensor (illustrated in both references at member 3) for communicating this required pressure information to the regulator), and

to regulate the control action (the voltage applied to the actuator) in dependence on the pressure (inherently, to achieve the “particular quantity of fuel to be injected” over a given time and through a determined opening size, Bernoulli's Principle requires knowledge of this pressure).

To more accurately control the amount of fuel injected using Klenk’s actuator, it would have been obvious to regulate Klenk’s control action (applied voltage) in response to the fuel pressure, as taught by Wirbeleit I. (Note that this step would occur during Klenk's idle times, since Wirbeleit I teaches the process to occur during injection and Klenk’s idle time corresponds to injection.)

Regarding claim 12, Schrod teaches the step of determining the controlled variable by measuring a voltage across the actuator and/or a charge of the actuator (see col. 5 lines 50-57).

With regard to claim 13, Klenk discloses charging and/or discharging by a specified charging characteristic and/or discharging characteristic having a specified shape and steepness (see the V-t curve of FIG 2).

With regard to claims 14 and 15, Schrod teaches that it was known to adjust the steepness and shape of the charging characteristic as part of the regulating step. (See column 6 lines 17-21: “different forms … of the charging curve … can now be represented … as a function of … variations of the energy storage capacitor voltage". Note that a different shape implies a different steepness, and that a different form implies a different shape). To account for variations using an energy storage capacitor with Klenk's device, it would have been obvious to adjust the steepness and shape of the charging characteristic as part of the regulating step.

With regard to claim 16, Schrod teaches that it was known to determine the control action by the charging duration (see description of “possible forms and durations of the charging curve” at column 6, lines 17-29), wherein the charging duration is adjusted as part of the regulating step (see reference to “variations of the energy storage capacitor voltage”, at column 6 lines 17-21). To meet injection volume requirements with a low capacity injection valve using Klenk’s device, it would have been obvious to determine the control action by adjusting the charging duration, as taught by Schrod.

With regard to claim 17, Klenk discloses the actuator to be a piezoelectric actuator and the valve to be an injection valve for an internal combustion engine (see Background).

With regard to claim 18, the result of controlling operation of the valve is to change the pressure of the fluid supplied to the valve, which is measured by pressure sensor, which controls operation of the valve.

With regard to claim 19, Klenk discloses a control device for at least one valve actuator, the control device comprising a controller (2, 7, 9) for charging and/or discharging (from 0V to 100V) an actuator (8) in accordance with a control action (applied voltage, determined by “engine controller 9” and “switch over control unit 7”) to move the actuator to a predetermined first open valve position (“injection setting a"; see Abstract - voltages supplied to actuator correspond to various open valve positions) specified by a first setpoint value (100V) and for charging and/or discharging (from 100V to 200V) the actuator in accordance with the control action to move the actuator from the first open valve position (“injection setting a”) to a predetermined second open valve position (“injection setting b”) specified by a second setpoint value (200V) such that the actuator is not substantially completely discharged while moving from the first open valve position to the second open valve position (see FIG 2), the first open valve position corresponding to a charge state (100V), and the second open valve position corresponding to a further charge state (200V), said controller being characterized by the control action (the controller produces the control action).

Klenk does not disclose the closed-loop control regulator as required of the claim. Schrod teaches that, to avoid discharge of an actuator during idle times due to parasitic resistances, it was known in the art to employ:

a closed-loop control regulator connected to a similar controller for adapting the control action of said controller (this reads on the structure which implements the comparison function and adjustment function, described at col. 5 lines 50-57; this is closed-loop because the results of the recharging steps are necessarily incorporated into the succeeding measurements of the actuator voltage);

said regulator having an input connected to the actuator and/or to the valve in order to acquire a first controlled variable (inherent as the regulator obtains the actuator voltage);

the controlled variable reflecting a charge state of the actuator and/or a valve position (see description of “actuator voltage” at column 5 lines 50-54); and

said regulator being configured to acquire the controlled variable discontinuously during idle times in each case and adjusting the control action discontinuously in idle times in each case (see description of operation during "hold phases" at column 5 lines 50-57, where the hold times are discontinuous).

To avoid discharge of the actuator during Klenk’s idle times due to parasitic resistances, it would have been obvious to use a closed loop regulator, as taught by Schrod.

Klenk does not disclose a regulator which has an input connected to at least one sensor for detecting a pressure at the valve, wherein the pressure defines the controlled variable. However, Wirbeleit I teaches that it was known in the art at the time of invention to use a similar regulator (20) having an input connected to at least one pressure sensor for detecting a pressure at the valve (at 3, inherency explained above; evidenced by US 5,601,067), wherein the pressure defines the controlled variable (inherently, the pressure must be known and calculated according to Bernoulli's equation to arrived at a desired quantity of fuel injected through a given orifice size over a specified time). To more accurately control the amount of fuel injected using Klenk's actuator, it would have been obvious to regulate the control action (applied voltage) in response to fuel pressure, as taught by Wirbeleit I.

With regard to claim 20, at the time the invention was made, it would have been an obvious matter of design choice to a person of ordinary skill in the art to superimpose the regulator onto the controller because applicant has not disclosed that this position provides an advantage, is used for a particular purpose, or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Applicant's invention to perform equally well with the combinatorial device because the position of a regulator would not substantially and materially affect its function.

With regard to claim 21, see the analysis of claim 17 above.

Regarding claims 22 and 24, Klenk discloses the actuator to be exclusively charged in order to move from the first open valve position to the second open valve position (the voltage is increased).

Regarding claims 23 and 25, the use of biased open valves was notoriously well known in the art at the time of invention (taken as admitted prior art since Applicant did not traverse the assertion found in the preceding action), and it would have been obvious to use Klenk's device to predictably control the operation of a biased open valve. Alternatively, the first open valve position reads on Klenk's injection setting "b", and the second open valve position reads on Klenk's injection setting "c".

Regarding claims 26 and 27, the combinatorial apparatus requires <u>the control action</u>, which *has been* regulated in dependence on the controlled variable and the external measured variable (which may or may not *continue to* be effected by such manipulation), <u>to take effect</u> when a subsequent setpoint value is used to specify a subsequent open valve position (Schrod's regulation method would be applied to each of Klenk's hold phases, since Schrod teaches the general desirability of regulation during hold phases).

Regarding claim 28, Klenk also discloses discharging the actuator (see transition from setting "b" to setting "c") in accordance with the control action (applied voltage, from 200V to 50V), and determining the control action for the discharging by a specified

discharging characteristic which has a specified shape and steepness (see the shape of the curve V-t at FIG 2).

4. Claims 10-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Klenk in view of Schrod and Wirbeleit II (US 5,601,067).

Regarding claims 10 and 11, Klenk discloses (see FIG 2) charging and/or discharging (from 0V to 100V) an actuator (8) in accordance with a control action (applied voltage, determined by “engine controller 9” and “switch over control unit 7”) to move the actuator to a predetermined first open valve position (“injection setting a"; see Abstract - voltages supplied to actuator correspond to various open valve positions) specified by a first setpoint value (100V) and charging and/or discharging (from 100V to 200V) the actuator in accordance with the control action to move the actuator from the first open valve position (“injection setting a”) to a predetermined second open valve position (“injection setting b”) specified by a second setpoint value (200V) such that the actuator is not substantially completely discharged while moving from the first open valve position to the second open valve position (see FIG 2), the first open valve corresponding to a charge state (100V), and the second open valve position corresponding to a further charge state (200V).

Klenk discloses idle times of the actuator (the ideal profiles of settings “a”, “b” and “c", which are represented by dotted lines in FIG 2), but does not disclose the step

of determining a controlled variable (i.e., voltage at the actuator) reflecting the charge state of the actuator during these idle times, and regulating the control action (i.e., applied voltage) during these idle times. Schrod teaches that it was known in the art at the time of invention to determine a controlled variable ("actuator voltage, U_p") during idle times, and to regulate a control action (the applied voltage) during idle times, in order to avoid actuator discharge due to parasitic resistances (see col. 5 lines 50-57). To avoid discharge of Klenk's actuator during idle times due to parasitic resistances, it would have been obvious to determine a controlled variable (voltage at the actuator) and to regulate the control action in response thereto, as taught by Schrod.

Klenk does not disclose the step of acquiring an external measured variable in the form of pressure at the valve and regulating the control action in dependence on the pressure during the idle time. Wirbeleit II teaches that it was known in the art at the time of invention to acquire a measured variable in the form of pressure at an injection valve, and to regulate the control action (the voltage applied to the actuator) in dependence on this pressure (see col. 2 lines 29-40).

To more accurately control the amount of fuel injected using Klenk's actuator, it would have been obvious to regulate Klenk's control action (applied voltage) in response to the fuel pressure, as taught by Wirbeleit II. (Note that this step would occur during Klenk's idle times, since Wirbeleit II teaches the process to occur during injection and Klenk's idle time occurs during injection.)

Regarding claims 12-18, see the corresponding analyses set forth under paragraph 3 above.

With regard to claim 19, Klenk discloses a control device for at least one valve actuator, the control device comprising a controller (2, 7, 9) for charging and/or discharging (from 0V to 100V) an actuator (8) in accordance with a control action (applied voltage, determined by “engine controller 9” and “switch over control unit 7”) to move the actuator to a predetermined first open valve position (“injection setting a"; see Abstract - voltages supplied to actuator correspond to various open valve positions) specified by a first setpoint value (100V) and for charging and/or discharging (from 100V to 200V) the actuator in accordance with the control action to move the actuator from the first open valve position (“injection setting a”) to a predetermined second open valve position (“injection setting b”) specified by a second setpoint value (200V) such that the actuator is not substantially completely discharged while moving from the first open valve position to the second open valve position (see FIG 2), the first open valve position corresponding to a charge state (100V), and the second open valve position corresponding to a further charge state (200V), said controller being characterized by the control action (the controller produces the control action).

Klenk does not disclose the closed-loop control regulator as required of the claim. Schrod teaches that, to avoid discharge of an actuator during idle times due to parasitic resistances, it was known in the art to employ:

a closed-loop control regulator connected to a similar controller for adapting the control action of said controller (this reads on the structure which implements the comparison function and adjustment function, described at col. 5 lines 50-57; this is closed-loop because the results of the recharging steps are necessarily incorporated into the succeeding measurements of the actuator voltage);

said regulator having an input connected to the actuator and/or to the valve in order to acquire a first controlled variable (inherent as the regulator obtains the actuator voltage);

the controlled variable reflecting a charge state of the actuator and/or a valve position (see description of “actuator voltage” at column 5 lines 50-54); and

said regulator being configured to acquire the controlled variable discontinuously during idle times in each case and adjusting the control action discontinuously in idle times in each case (see description of operation during "hold phases" at column 5 lines 50-57, where the hold times are discontinuous).

To avoid discharge of the actuator during Klenk’s idle times due to parasitic resistances, it would have been obvious to use a closed loop regulator, as taught by Schrod.

Klenk does not disclose a regulator which has an input connected to at least one sensor for detecting a pressure at the valve, wherein the pressure defines the controlled variable. However, Wirbeleit II teaches that it was known in the art at the time of invention to use a similar regulator (12) having an input connected to at least one pressure sensor (24) for detecting a pressure at the valve, wherein the pressure defines the controlled variable (col. 2 lines 29-40). To more accurately control the amount of fuel injected using Klenk's actuator, it would have been obvious to regulate the control action (applied voltage) in response to a sensed fuel pressure, as taught by Wirbeleit II.

Regarding claims 20-28, see the corresponding analyses set forth under paragraph 3 above.

5. Claims 10-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Klenk in view of Schrod and Wirbeleit I, where Wirbeleit I is taken with Wirbeleit II.

Regarding claims 10 and 11, Klenk discloses (see FIG 2) charging and/or discharging (from 0V to 100V) an actuator (8) in accordance with a control action (applied voltage, determined by "engine controller 9" and "switch over control unit 7") to move the actuator to a predetermined first open valve position ("injection setting a"; see Abstract - voltages supplied to actuator correspond to various open valve positions) specified by a first setpoint value (100V) and charging and/or discharging (from 100V to 200V) the actuator in accordance with the control action to move the actuator from the first open

valve position (“injection setting a”) to a predetermined second open valve position (“injection setting b”) specified by a second setpoint value (200V) such that the actuator is not substantially completely discharged while moving from the first open valve position to the second open valve position (see FIG 2), the first open valve corresponding to a charge state (100V), and the second open valve position corresponding to a further charge state (200V).

Klenk discloses idle times of the actuator (the ideal profiles of settings “a”, “b” and “c", which are represented by dotted lines in FIG 2), but does not disclose the step of determining a controlled variable (i.e., voltage at the actuator) reflecting the charge state of the actuator during these idle times, and regulating the control action (i.e., applied voltage) during these idle times. Schrod teaches that it was known in the art at the time of invention to determine a controlled variable ("actuator voltage, U_p”) during idle times, and to regulate a control action (the applied voltage) during idle times, in order to avoid actuator discharge due to parasitic resistances (see col. 5 lines 50-57). To avoid discharge of Klenk’s actuator during idle times due to parasitic resistances, it would have been obvious to determine a controlled variable (voltage at the actuator) and to regulate the control action in response thereto, as taught by Schrod.

Klenk does not disclose the step of acquiring an external measured variable in the form of pressure at the valve and regulating the control action in dependence on the pressure during the idle time. Wirbeleit I inherently requires:

the acquisition of a measured variable in the form of pressure at the injection valve (see col. 3 lines 12-16; to obtain a "particular quantity of fuel to be injected" the pressure must be known, since according to Bernoulli's Principle the pressure determines the rate of flow through orifice 18a), and

regulation of the control action (the voltage applied to the actuator) in dependence on the pressure (inherently, to achieve the "particular quantity of fuel to be injected" (id.) over a given time and through a determined opening size, Bernoulli's Principle requires knowledge of this pressure).

Further, Wirbeleit II teaches that it was known to use a pressure sensor to acquire a measured pressure at the injector, and to regulate the control action (actuator voltage) based on this pressure (see col. 2 lines 29-40), as inherently required of Wirebeleit I.

To more accurately control the amount of fuel injected using Klenk's actuator, it would have been obvious to regulate Klenk's control action (applied voltage) in response to the fuel pressure, as taught by Wirbeleit I taken with Wirbeleit II. (Note that this step would occur during Klenk's idle times, since Wirbeleit I and II teach the process to occur during injection, and since Klenk's idle time corresponds to injection.)

Regarding claims 12-18, see the corresponding analyses set forth under paragraph 3 above.

With regard to claim 19, Klenk discloses a control device for at least one valve actuator, the control device comprising a controller (2, 7, 9) for charging and/or discharging (from 0V to 100V) an actuator (8) in accordance with a control action (applied voltage, determined by “engine controller 9” and “switch over control unit 7”) to move the actuator to a predetermined first open valve position (“injection setting a"; see Abstract - voltages supplied to actuator correspond to various open valve positions) specified by a first setpoint value (100V) and for charging and/or discharging (from 100V to 200V) the actuator in accordance with the control action to move the actuator from the first open valve position (“injection setting a”) to a predetermined second open valve position (“injection setting b”) specified by a second setpoint value (200V) such that the actuator is not substantially completely discharged while moving from the first open valve position to the second open valve position (see FIG 2), the first open valve position corresponding to a charge state (100V), and the second open valve position corresponding to a further charge state (200V), said controller being characterized by the control action (the controller produces the control action).

Klenk does not disclose the closed-loop control regulator as required of the claim. Schrod teaches that, to avoid discharge of an actuator during idle times due to parasitic resistances, it was known in the art to employ:

a closed-loop control regulator connected to a similar controller for adapting the control action of said controller (this reads on the structure which implements the

comparison function and adjustment function, described at col. 5 lines 50-57; this is closed-loop because the results of the recharging steps are necessarily incorporated into the succeeding measurements of the actuator voltage);

said regulator having an input connected to the actuator and/or to the valve in order to acquire a first controlled variable (inherent as the regulator obtains the actuator voltage);

the controlled variable reflecting a charge state of the actuator and/or a valve position (see description of "actuator voltage" at column 5 lines 50-54); and

said regulator being configured to acquire the controlled variable discontinuously during idle times in each case and adjusting the control action discontinuously in idle times in each case (see description of operation during "hold phases" at column 5 lines 50-57, where the hold times are discontinuous).

To avoid discharge of the actuator during Klenk's idle times due to parasitic resistances, it would have been obvious to use a closed loop regulator, as taught by Schrod.

Klenk does not disclose a regulator which has an input connected to at least one sensor for detecting a pressure at the valve, wherein the pressure defines the controlled variable. However, Wirbeleit I teaches that it was known in the art at the time of invention to use a similar regulator (20), and inherently requires the regulator to have an input connected to at least one pressure sensor for detecting a pressure at the valve

(see col. 3 lines 12-16; to obtain a “particular quantity of fuel to be injected” the pressure must be known, since according to Bernoulli’s Principle the pressure determines the rate of flow through orifice 18a), wherein the pressure defines the controlled variable (inherently, the pressure must be known and calculated according to Bernoulli's equation in order to arrive at a desired quantity of fuel injected through a given orifice size over a specified time). To more accurately control the amount of fuel injected using Klenk’s actuator, it would have been obvious to regulate the control action (applied voltage) in response to fuel pressure, as taught by Wirbeleit I taken with Wirbeleit II.

Regarding claims 20-28, see the corresponding analyses set forth under paragraph 3 above.

Response to Arguments

6. Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection. Applicant argues that Wirbeleit I's pressure compensating piston (10) does not measure pressure. The examiner agrees. The pressure compensating piston (10) acts to produce an upward force (due to pressure in the pressure chamber (13) acting upwardly thereupon), this upward force counteracting the downward force produced by grooved body (14) (due to pressure in the pressure chamber (13) acting downwardly thereupon). Therefore, the net forces which control the position of the injector are due only to the spring (7) and the actuator (21), and thus “the orifice can be opened independently of the fuel pressure" as set forth

in Wirbeleit I's description. That is, Wirbeleit I's described "pressure independence" concerns the forces required to obtain a certain injector opening size, which is distinct from the inherent requirement for a pressure sensor as set forth in the rejection above. The inherent requirement for a pressure sensor as mapped in the rejection concerns Wirbeleit I's prediction of what volume of fuel is to be injected.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. **See MPEP** § 706.07(a) and **§ 1207.04**. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to WILLIAM MCCALISTER whose telephone number is (571)270-1869. The examiner can normally be reached on Monday through Friday, 9-7.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robin Evans can be reached on 571-272-4777. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/WILLIAM MCCALISTER/
Examiner, Art Unit 3753

/John Rivell/
Primary Examiner, Art Unit 3753

12/9/2009